CLAIMS

1. A reproducing apparatus, comprising:

data acquiring means for acquiring content data and synchronization timing information items;

clock generating means for generating a clock signal;

decoding means for converting, in accordance with the clock signal, the content data into reproduction data for reproduction output;

synchronization control means for transmitting synchronization control signals to synchronization processing means, in accordance with the clock signal, at timings specified by timing specifying information items included in the synchronization timing information items, respectively; and

the synchronization processing means for carrying out a process in accordance with each of the synchronization control signals received from the synchronization control means.

2. The reproducing apparatus as set forth in claim 1, wherein:

the data acquiring means further acquires synchronization executing programs, and

the synchronization processing means includes

program executing means for executing each of the synchronization executing programs in accordance with the synchronization control signal received from the synchronization control means.

3. The reproducing apparatus as set forth in claim 1, further comprising:

output generating means for generating second output data which is an output other than the reproduction data,

wherein:

the synchronization processing means includes output control means for controlling outputting of the second output data in accordance with the synchronization control signal received from the synchronization control means.

4. The reproducing apparatus as set forth in claim 2, wherein:

the synchronization processing means executes the synchronization executing program so as to generate output data, and outputs the output data in accordance with the synchronization control signal received from the synchronization control means.

5. The reproducing apparatus as set forth in claim 2, wherein:

the synchronization processing means executes the synchronization executing program, in accordance with the synchronization control signal received from the synchronization control means, so as to generate output data, and outputs the output data.

6. The reproducing apparatus as set forth in claim 4 or 5, wherein:

the synchronization processing means includes output control means for controlling the outputting of the output data in accordance with the synchronization control signal received from the synchronization control means, which outputting is caused by the synchronization control program.

7. The reproducing apparatus as set forth in claim 2, wherein:

the synchronization timing information items including the timing specifying information items includes action specifying information items, respectively and

when respectively transmitting the synchronization control signals to the program executing means at the timings specified by the timing specified information

items, the synchronization control means adds, to the synchronization control signals, action specifying information items corresponding to the timing specifying information items, respectively and

the program executing means executes a synchronization executing program specified by each of the action specifying information items included in the synchronization control signals received from the synchronization control means.

8. The reproducing apparatus as set forth in claim 2, wherein:

for starting reproduction from a certain point of the content data, the synchronization control means transmits, in accordance with synchronization timing information items respectively including timing specifying information items each indicating a time point coming before a time point from which the reproduction is started, the synchronization control signals in order from a synchronization control signal corresponding to earliest one of the time points respectively specified by the timing specifying information items.

9. The reproducing apparatus as set forth in claim 1 or 2, wherein:

each of the synchronization timing information items respectively including the timing specifying information items includes a dependency information item indicating a dependency relation with another synchronization timing information item,

for starting reproduction from a certain point of the content data, the synchronization control means transmits the synchronization control signals in accordance with (I) a synchronization timing information item that includes a timing specifying information item indicating a time point which comes before but is closest to a time point from which the reproduction is started, and that includes a dependency information item indicating that the synchronization timing information item is independent from other synchronization timing information items, and (II) synchronization timing information items that include timing specifying information items each indicating a time point which comes after the time point specified by the synchronization timing information item (I), and that include dependency information items respectively indicating that the synchronization timing information items are independent from other synchronization timing information items, the synchronization control signals being transmitted in order from a synchronization control

signal corresponding to earliest one of the time points respectively specified by the timing specifying information items.

10. The reproducing apparatus as set forth in claim 2, wherein:

the data acquiring means acquires a merged synchronization executing program allowing a result identical to a result obtained by executing a plurality of synchronization executing programs, and

each of the synchronization timing information items respectively including the timing specifying information items includes (i) an action specifying information item indicating a synchronization executing program to be executed, and (ii) a merged synchronization executing program identifying information item indicating whether or not the synchronization executing program indicated by the action specifying information item is the merged synchronization executing program, and

for starting reproduction from a certain point of the content data, the synchronization control means transmits the synchronization control signals in accordance with (I) a synchronization timing information item that includes a timing specifying information item specifying a time point which comes before but is closest

to a time point from which the reproduction is started, and that includes a merged synchronization executing program identifying information item indicating that the synchronization executing program to be executed is the merged synchronization executing program, and (II) synchronization timing information items that include timing specifying information items each indicating a time point which comes after the time point specified by the synchronization timing information item (I), and that include merged synchronization executing program identifying information items each indicating that the synchronization executing program to be executed is the merged synchronization executing program, the synchronization control signals being transmitted in order from a synchronization control signal corresponding to earliest one of the time points respectively specified by the timing specifying information items.

11. The reproducing apparatus as set forth in claim 2, wherein:

the data acquiring means acquires an arbitrary-point reproduction synchronization executing program, which is executed only when starting reproduction from a certain point of the content data, and

each of the synchronization timing information

items respectively including the timing specifying information items includes (i) an action specifying information item indicating a synchronization executing program to be executed, and (ii) an arbitrary-point reproduction synchronization executing program identifying information item indicating whether or not the synchronization executing program specified by the action specifying information is the arbitrary-point reproduction synchronization executing program, and

for starting reproduction from a certain point of the content data, the synchronization control means transmits the synchronization control signals in accordance with (I) a synchronization timing information item that includes a timing specifying information item indicating a time point which comes before but is closest to a time point from which the reproduction is started, and that includes an arbitrary-point reproduction synchronization executing program identifying information item indicating that the synchronization executing program to be executed is the arbitrary-point reproduction synchronization executing program, and (II) synchronization timing information items that include timing specifying information items each indicating a time point which comes after the time point specified by the synchronization timing information item (I), and that

include arbitrary-point reproduction synchronization executing program identifying information items each indicating that the synchronization executing program to be executed is the arbitrary-point reproduction synchronization executing program, the synchronization control signals being transmitted in order from a synchronization control signal corresponding to earliest one of the time points respectively specified by the timing specifying information items.

12. The reproducing apparatus as set forth in claim 2, wherein:

each of the synchronization timing information items includes an execution condition information item indicating a condition in which the decoding means is when the synchronization executing program should be executed, and

the synchronization control means monitors the condition of the decoding means, and transmits the synchronization control signal in accordance with (i) the condition of the decoding means and (ii) the execution condition information item.

13. The reproducing apparatus as set forth in claim 2, wherein:

the decoding means reproduces video data as the content data in order to output a video image, and

the program executing means executes, as the synchronization executing program, a program for generating image data to be overlaid with the video image.

14. A reproducing apparatus, comprising:

data acquiring means for acquiring content data and a synchronization executing program;

program executing means for executing the synchronization executing program;

clock generating means for generating a clock signal;

decoding means for converting, in accordance with the clock signal, the content data into reproduction data for reproduction output;

synchronization control means for transmitting a synchronization control signal to the program executing means at a predetermined timing in accordance with the clock signal; and

input means for receiving reproduction control manipulation from outside, and for converting the reproduction control manipulation into reproduction control information,

the decoding means being controlled in accordance

with the reproduction control information sent from the input means,

the program executing means executing the synchronization executing program in accordance with at least the synchronization control signal sent from the synchronization control means.

15. A reproducing apparatus, comprising:

data acquiring means for acquiring content data items, synchronization executing programs, and program management information items;

decoding means for converting each of the content data items to reproduction data for reproduction output; and

program executing means for executing each of the synchronization executing programs,

each of the program management information items including (i) a program specifying information item for specifying a program to be simultaneously used for the reproduction output together with a content data item, and (ii) a content data specifying information item for specifying the content data item to be simultaneously used for the reproduction output together with the program,

said reproducing apparatus, further comprising:

general control means for (i) instructing the program executing means to execute the synchronization executing program specified by the program specifying information item, and either (ii) instructing the decoding means to convert the content data item specified by the content specified information item, or (iii) instructing the data acquiring means to acquire the content data item specified by the content specifying information item.

16. The reproducing apparatus as set forth in claim 15, wherein:

each of the program management information items includes a reproduction start instruction necessity information item indicating whether or not an instruction from a synchronization executing program is required for start of reproduction of each of the content data items, and

in cases where the reproduction start necessity information indicates that the instruction from the synchronization executing program is required, the decoding means do not start reproducing the content data item until the decoding means receives the instruction from the synchronization executing program.

17. A reproducing apparatus, comprising:

data acquiring means for acquiring content data, a synchronization executing program, and program management information;

decoding means for converting the content data into reproduction data for reproduction output;

program executing means for executing the synchronization executing program;

input means for receiving reproduction control manipulation from outside, and for converting the reproduction control manipulation into reproduction control information; and

switching means for (a) selecting, in accordance with reproduction control switching information included in the program management information, either one of (i) the reproduction control information sent from the input means and (ii) reproduction control information sent from the program executing means, and (b) sending the selected reproduction control information to the decoding means.

18. A reproducing apparatus, comprising:

data acquiring means for acquiring content data, a synchronization executing program, and program management information;

decoding means for converting the content data into

reproduction data for reproduction output;

program executing means for executing the synchronization executing program; and

general control means for suspending the reproduction output obtained by using the content data and the synchronization executing program, and for resuming the reproduction from a point at which the reproduction output was suspended;

the program management information including resuming capability information indicating whether or not a resuming function is enabled, which resuming function is a function for resuming the reproduction from the point at which the reproduction output obtained by using the content data and the synchronization executing program was suspended,

in cases where the program management information indicates that the resuming function is not enabled, the general control means never instructing start of the reproduction from the point at which the reproduction output was suspended.

19. A reproducing apparatus, comprising:

data acquiring means for acquiring content data, a synchronization executing program, and program management information;

decoding means for converting the content data into reproduction data for reproduction output; and

program executing means for executing the synchronization executing program,

the program management information including resuming capability information whether or not a resuming function is enabled, which resuming function is a function for resuming the reproduction from the point at which the reproduction output obtained by using the content data and the synchronization executing program was suspended,

said reproducing apparatus, further comprising:

notifying means for notifying, in cases where the resuming capability information indicates that the resuming function is not enabled, a user that the resuming function is not enabled, the notifying being carried out in response to any one of a user's suspending instruction, a user's instruction requiring suspending, and an instruction for resuming reproduction from a suspension point.

20. A reproducing apparatus, comprising:

data acquiring means for acquiring content data items, a synchronization executing program, and program management information;

decoding means for converting each of the content data items into reproduction data for reproduction output; and

program executing means for executing the synchronization executing program,

the program management information including at least content data specifying information for specifying a content data item which is simultaneously used for the reproduction output together with the synchronization executing program,

said reproducing apparatus, further comprising:

verifying means for verifying whether or not the content data item which the synchronization executing program instructs the decoding means to decode is the content data item specified by the program management information.

21. A reproducing apparatus, comprising:

data acquiring means for acquiring content data items, a synchronization executing program, program management information, and verification-use information;

decoding means for converting each of the content data items into reproduction data for reproduction output; and

program executing means for executing the synchronization executing program,

the program management information including at least authorization information which approves use of a content data item that is simultaneously used for the reproduction output together with the synchronization executing program,

said reproducing apparatus, further comprising:

verifying means for verifying, by using the verification-use information, authorization information of the content data item which the synchronization executing program instructs the decoding means to decode.

22. The reproducing apparatus as set forth in claim 21, wherein:

the verifying information is a public key, and

the authorization information is information obtained by encrypting information specific to the synchronization executing program by using a private key corresponding to the public key, and

the verifying means decrypts the authorization information by using the verification-use information, and carries out verification in accordance with a result obtained through the decrypting.

23. The reproducing apparatus as set forth in any one of claims 20 through 22, wherein:

in cases where the authorization information is not so confirmed as to be appropriate as a result of the verification carried out by the verifying means, the program executing means terminates the execution of the synchronization executing program.

24. A control program for causing the reproducing apparatus as set forth in any one of claims 1 through 23 to operate, and for causing a computer to operate as the synchronization control means and the synchronization processing means.

25. A computer-readable recording medium for storing the control program as set forth in claim 24.

26. A content recording medium for storing at least any one of content data, a synchronization executing program, and synchronization timing information such that the content data, the synchronization executing program, and the synchronization timing information are able to be supplied to the reproducing apparatus as set forth in any one of claims 1 through 14.

27. A content recording medium for storing content data and synchronization timing information such that the content data and the synchronization timing information are able to be supplied to the reproducing apparatus as set forth in any one of claims 1 through 14,

the synchronization timing information being separated from the content data.

28. A content recording medium for storing a synchronization executing program and synchronization timing information such that the synchronization executing program and the synchronization timing information are able to be supplied to the reproducing apparatus as set forth in any one of claims 1 through 14,

the synchronization timing information being stored in a vicinity of the synchronization executing program.

29. A content recording medium for storing a synchronization executing program and synchronization timing information such that the synchronization executing program and the synchronization timing information are able to be supplied to the reproducing apparatus as set forth in any one of claims 1 through 14,

the synchronization timing information and the

synchronization executing program being stored in a same file.

30. A content recording medium for storing at least any one of content data, a synchronization executing program, and synchronization timing information such that the content data, the synchronization executing program, and the synchronization timing information are able to be supplied to the reproducing apparatus as set forth in any one of claims 15 through 23.

31. A content recording medium for storing at least content data items, program management information, and verification-use information items such that the content data items, the program management information, and the verification-use information items are able to be supplied to the reproducing apparatus as set forth in claims 21 through 23,

the program management information including at least authorization information which approves use of a content data item that is simultaneously used for reproduction output together with the synchronization executing program,

the verification-use information items being included in the content data items, respectively.

32. The content recording medium as set forth in claim 31, wherein:

the verification-use information items are multiplexed in each of the content data items with predetermined intervals therebetween.

33. The content recording medium as set forth in claim 31 or 32, wherein:

each of the content data items has (i) a part in which a verification-use information item of the verification-use information items is used, and (ii) a part in which a different verification-use information item is used.

34. A method for controlling a reproducing apparatus including data acquiring means, decoding means, and synchronization processing means,

said method, comprising the steps of:

causing the data acquiring means to acquire content data and synchronization timing information;

causing the decoding means to (i) convert, in accordance with the clock signal, the content data into reproduction data for reproduction output, and (ii) send a synchronization control signal to the synchronization

processing means in accordance with the clock signal at a timing specified by timing specifying information included in the synchronization timing information; and

causing the synchronization processing means to carry out a process in accordance with the synchronization control signal.

35. A method for controlling a reproducing apparatus including data acquiring means, program executing means, clock generating means, decoding means, synchronization control means, and input means,

said method, comprising the steps of:

(A) causing the data acquiring means to acquire content data and a synchronization executing program;

(B) causing the program executing means to execute the synchronization executing program;

(C) causing the clock generating means to generate a clock signal;

(D) causing the decoding means to convert, in accordance with the clock signal, the content data into reproduction data for reproduction output;

(E) causing the synchronization control means to transmit a synchronization control signal to the program executing means at a predetermined timing in accordance with the clock signal; and

(F) causing the input means to (i) receive reproduction control manipulation from outside, and (ii) convert the reproduction control manipulation into reproduction control information,

in the step (D), the decoding means being controlled in accordance with the reproduction control information sent from the input means,

in the step (B), the program executing means executing the synchronization executing program in accordance with at least the synchronization control signal sent from the synchronization control means.

36. A method for controlling a reproducing apparatus including decoding means, program executing means, and data acquiring means,

said method, comprising the steps of:

causing the data acquiring means to acquire content data items, synchronization executing programs, and program management information items;

causing decoding means to convert each of the content data items to reproduction data for reproduction output; and

causing the program executing means to execute each of the synchronization executing programs,

each of the program management information items

including (i) a program specifying information item for specifying a program to be simultaneously used for the reproduction output together with a content data item, and (ii) a content data specifying information item for specifying the content data item to be simultaneously used for the reproduction output together with the program,

said method, further comprising the step of:

instructing the program executing means to execute the synchronization executing program specified by the program specifying information item, and either (ii) instructing the decoding means to convert the content data item specified by the content specified information item, or (iii) instructing the data acquiring means to acquire the content data item specified by the content specifying information item.

37. A method for controlling a reproducing apparatus including decoding means, program executing means, data acquiring means, and verifying means,

said method, comprising the steps of:

causing the data acquiring means to acquire content data items, a synchronization executing program, and program management information;

causing the decoding means to convert each of the

content data items into reproduction data for reproduction output; and

causing the program executing means to execute the synchronization executing program,

the program management information including at least content data specifying information for specifying a content data item which is simultaneously used for the reproduction output together with the synchronization executing program,

said method, further comprising the step of:

causing the verifying means to verify whether or not the content data item which the synchronization executing program instructs the decoding means to decode is the content data item specified by the program management information.

38. A method for controlling a reproducing apparatus including decoding means, program executing means, data acquiring means, and verifying means,

said method, comprising the steps of:

causing the data acquiring means to acquire content data items, a synchronization executing program, program management information, and verification-use information;

causing the decoding means to convert each of the

content data items into reproduction data for reproduction output; and

causing the program executing means to execute the synchronization executing program,

the program management information including at least authorization information which approves use of a content data item that is simultaneously used for the reproduction output together with the synchronization executing program,

said reproducing apparatus, further comprising:

verifying means for verifying, by using the verification-use information, authorization information of the content data item which the synchronization executing program instructs the decoding means to decode.

39. A data structure, comprising:

a content data storing region for storing content data to be reproduced by a reproducing apparatus;

a synchronization executing program storing region for storing a synchronization executing program to be executed by the reproducing apparatus in synchronization with the reproduction of the content data; and

a synchronization timing information storing region for storing synchronization timing information indicating

a timing at which the synchronization executing program is executed.

40. A data structure, comprising:

a content data storing region for storing content data items to be reproduced by a reproducing apparatus;

a synchronization executing program storing region for storing synchronization executing programs to be executed by the reproducing apparatus in synchronization with the reproduction of the content data items, respectively; and

a program management information storing region for storing program management information items each including (i) a program specifying information item for specifying a program to be simultaneously used for reproduction output together with a content data item, and (ii) a content data specifying information item for specifying the content data item to be simultaneously used for the reproduction output together with the program.

41. The data structure as set forth in claim 40, wherein:

each of the program management information items includes at least authorization information which

approves use of the content data item that is simultaneously used for the reproduction output together with the synchronization executing program, and

each of the content data items includes verification-use information for verifying the authorization information.